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THE SYSTEM OF MEASURES TO IMPROVE THE HEALTH OF THE POPULATION OF UKRAINE BASED ON THE ANALYSIS OF THE GLOBAL BURDEN OF DISEASES AND ITS RISK FACTORS

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Abstract. *The system of measures to improve the health of the population of Ukraine based on the analysis of the global burden of diseases and its risk factors. Lekhan V.M., Kriachkova L.V. In the modern world, the use of the global burden of diseases and the quantitative assessment of the factors leading to the loss of a healthy life provides fundamental evidence for the development of an adequate public health policy. The purpose of the study is to substantiate the system of measures on improvement of the health of the population of Ukraine on the basis of an in-depth analysis of the global burden of diseases and injuries and associated risks. The study used materials from the Institute of Health Metrics and Evaluation of the University of Washington, Human Development Network of the World Bank and the «Disease Burden Unit» of the World Health Organization, collected during 1990-2017 years. The bibliosemantic, historical, epidemiological, conceptual modeling methods and benchmarking were used in the course of study. The loss rate of age-standardized disability-adjusted life year (DALY) in Ukraine in the period between 1990-2017 practically unchanged and in 2017 it was 34 975.04 DALYs per 100 000, which is almost a quarter more than in the countries of Eastern Europe and twice as much as in the countries of Western Europe. In the structure of Global diseases burden in Ukraine, 3/4 falls on non-communicable diseases, about 15 % depend on external causes and less than 1/10 – on infectious and other diseases and conditions. Shares of the disease burden associated with specific risk factors and diseases related to the relevant factor were identified. The evidence-based system of measures is aimed at achieving goals to reduce the global burden of disease and the risk factors affecting it, being based on an inter-sectoral approach and combines population and individual risk strategies. The subjects of the system are parliament, central and local governments / communities, private campaigns, the media, public health structures and primary health care.*

Реферат. *Система мер по улучшению здоровья населения Украины на основе анализа глобального бремени болезней и факторов его риска. Лехан В.М., Крячкова Л.В. В современном мире использование глобального бремени болезней и количественной оценки факторов, приводящих к потерям здоровой жизни, позволяет получить фундаментальные доказательства для выработки адекватной политики в сфере общественного здравоохранения. Цель исследования – обосновать систему по улучшению здоровья населения Украины на основе углубленного анализа глобального бремени болезней, травм и связанных с ними рисков для здоровья. Использованы данные Института по измерению здоровья и оценки состояния здоровья университета Вашингтона, сети человеческого развития Всемирного банка и отдела бремени болезней ВОЗ, собранные в течение 1990-2017 годов. Исследование проводилось с использованием библиосемантического, исторического, эпидемиологического методов, метода концептуального моделирования и бенчмаркинга. Уровень потерь стандартизированных по возрасту лет жизни в Украине от преждевременной смерти с*

поправкой на инвалидность в период 1990-2017 гг. практически не изменился и составлял в 2017 г. 34 975,04 на 100 000 населения, что почти на четверть больше, чем в странах Восточной Европы и вдвое больше по сравнению со странами Западной Европы. В структуре потерь лет здоровой жизни в Украине 3/4 приходится на неинфекционные заболевания, около 15 % зависит от внешних причин и менее 1/10 – от инфекционных и других заболеваний и состояний. Определены доли бремени болезней, связанные с конкретными факторами риска и заболеваниями, относящимися к соответствующему фактору. Разработанная на основе полученных фактических данных система мер ориентирована на достижение целей по уменьшению глобального бремени болезней и влияющих на него факторов риска, базируется на межсекторальном подходе и сочетает популяционные и ориентированные на конкретные категории риска стратегии. Субъектами системы определены парламент, центральное и местные правительства/общины, частные кампании, средства массовой информации, структуры общественного здравоохранения и первичной медико-санитарной помощи.

Health of the population is a major resource and paramount value for any country. In the last decade, there has been a body of evidence as for the significant impact of health systems on the health and well-being of both individual and society as a whole. The key contribution to achieving positive results lies in the subsystems of primary health care and public health. The latter aims to identify the factors affecting health and to coordinate the activities of all organizations, institutes and resources involved in improving health [5, 10].

It should be noted that as a result of the epidemiological transition, when major health problems are more likely to be caused by non-communicable diseases, the impact of diseases on health is determined not only by premature mortality but also by disability and their associated risk in factors. That is why in the world developing evidence-based health policy, the concept of Global Burden of Disease (GBD) measured by an indicator that combines years of life lost through premature death and years of life lost due to health conditions that do not meet the criteria of full health - years of disability-adjusted life year (DALY) is being increasingly used [6].

The relevance of the study is due to the fact that in Ukraine, as before, the state of public health and its dynamics are estimated disintegratedly by morbidity and mortality rates. The scientific investigations of GBD are single and mainly concern the reasoning for its implementation in Ukraine. There is no regular monitoring of risk factors and their association with diseases. The study of risks is carried out mainly for scientific purposes and usually refers to individual diseases or their groups [2, 5].

Under the conditions of transformation of the national healthcare system, there is an urgent need to use integrated indicators to identify the strategic objectives of the reforms and the results of their implementation.

The purpose of the study is to substantiate the system of measures for improvement of the health of the Ukrainian population based on an in-depth analysis of the global burden of disease, trauma and the associated health risks.

MATERIALS AND METHODS OF RESEARCH

To study the global burden of disease and trauma and associated risks, highly reliable demographic and epidemiological data collected and compiled by the Washington Institute for Health Metrics and Evaluation (IHME). - <http://www.healthdata.org/gbd>), Human Development Network of the World Bank and the Disease Burden Unit of the World Health Organization (https://www.who.int/gho/mortality_burden_disease/countries/situation_trends_dalys/en/) conducting longitudinal studies of GBD (systematic analysis of the global burden of disease covers 354 diseases and injuries to 195 countries and territories during the 1990-2017 years) and quantitative assessment of risk factors have been used [8, 9]. The main unit of measure was age-standardized losses from premature death adjusted for disability or losses of healthy life years per 100,000 of population. The profile of Ukraine on the global burden of disease (<http://www.healthdata.org/ukraine>) was also analyzed for a detailed description of the situation. The WHO database "Health for All" (WHO Europe "HFA-DB" - <https://gateway.euro.who.int/en/datasets/european-health-for-all-database/>) and the State Statistics Service of Ukraine (National Health Accounts 2003-2016 - http://www.ukrstat.gov.ua/druk/publicat/kat_u/publzdorov_u.htm) supplemented information database.

The study used bibliosemantic, historical, epidemiological methods, conceptual modeling and benchmarking.

Statistical processing of the results was performed using the software STATISTICA 6.1 (StatSoftInc., Serial No. AGAR909E415822FA) and

Excel-2010 using methods of parametric and non-parametric statistics, analysis of series of dynamics; the arithmetic mean (M), 95% confidence interval (CI), Pearson correlation coefficients (r) were calculated. The critical significance level of statistical significance was assumed at $p < 0.05$ (5%).

RESULTS AND DISCUSSION

In Ukraine, during the period of independence (1990-2017), age-standardized losses from premature death adjusted for disability ranged from 32355.4 per 100,000 of population (minimum level in 2013) to 42725.9 (maximum level in 1995); the average level for 28 years of observation was

37 657.8 (95% CI 36 557.1 – 38 758.4) per 100,000 population (Fig. 1).

Overall, the DALY dynamics showed a slight trend to decrease - the average rate of decline is - 0.51% per year. The highest rate of decrease was observed from 2008 to 2009 and made up 8.87%. From 2014 to 2015, a significant increase by 14.59% was observed, then its gradual decrease started again, which continues to the present time. By the exponential smoothing method using the damped trend model for the off-season component, it was determined that during 2019-2027 the value of DALY will practically not change and will be 34870,4-34865,8 per 100 thousand of population respectively.



Fig. 1. Dynamics of age-standardized losses of years of life in Ukraine from premature death adjusted for all reasons for disability (1990-2017 per 100,000 of population)

In 2017 the DALY level was 34,975.04 per 100,000 of population, almost a quarter higher than in Eastern Europe and twice as high as in Western Europe (Table 1).

In the structure of DALY in Ukraine, 3/4 of losses of healthy life years fall on non-communicable diseases, about 15% depend on external causes and less than 1/10 – on infectious and other diseases and conditions (Fig. 2).

These differences are largely due to the particularities of the organization of public health systems, but economic factors play a leading role [1].

Ukraine belongs to the countries with below-average income level and by the value of gross

domestic product (GDP) both in nominal terms and in terms of purchasing power parity (PPP), and occupies a next to last place in Europe. Accordingly, health care costs in the country are very low compared to European ones – according to the World Bank, in 2016 the PPP amounted to 141.19 international dollars per capita, which is almost 25 times less than the European average. Significant feedback ($r = -0.74$; $p = 0.01$) was established between the level of health care costs by PPP in different countries and the age-standardized loss of healthy life years per 100,000 of population. Strong significant feedback ($r = -0.78$; $p = 0.001$) was established between health care expenditures (in US dollars per capita) and

losses of years of healthy living in Ukraine (Fig. 3), although one should remember that there is a certain

lag between financial investments and their impact on health indicators of population.

Table 1

Age-standardized DALY values per 100,000 of people for all causes in Ukraine and in isolated countries of Europe (2017)

Country	DALY per 100,000 of population
Ukraine	34 975,04
Isolated countries of Eastern Europe	
Poland	23 319,6
Romania	26 876,81
Hungary	24 766,93
Belarus	28 414,96
Isolated countries of Western Europe	
Germany	19 627,9
France	17 937,11
Italy	17 172,7
Spain	17 086,0

Half of the losses depend on 10 leading causes, among which ischemic heart disease (IHD), strokes and cirrhoses occupy the first three places (Table 2).

The health of an individual, a group of people or the population as a whole, including the losses of healthy life develop under the influence of a large number of factors, the so-called risk factors, which include unmanaged (not modified, such as age, gender, etc.) and managed (modified). Studying the latter is of particular importance for health care. In Ukraine, among the top global managed risk factors

for losses of healthy life, the top 5 places in descending order are: dietary risks (significant consumption of foodproducts high in calories and fats, salt / sodium, free sugars and low consumption of fruits, nuts and seeds and whole grains), high blood pressure, alcohol abuse, smoking and excessive body weight. Further in descending order: insufficient physical activity, high total cholesterol, high plasma glucose, particulate air pollution, occupational risks, illegal drugs use [3].

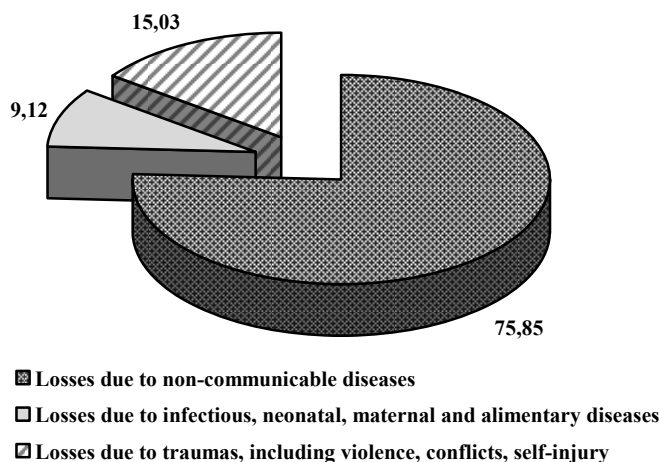


Fig. 2. Structure of age-standardized losses of life (DALY) in Ukraine in 2017 for the main causes (in%)

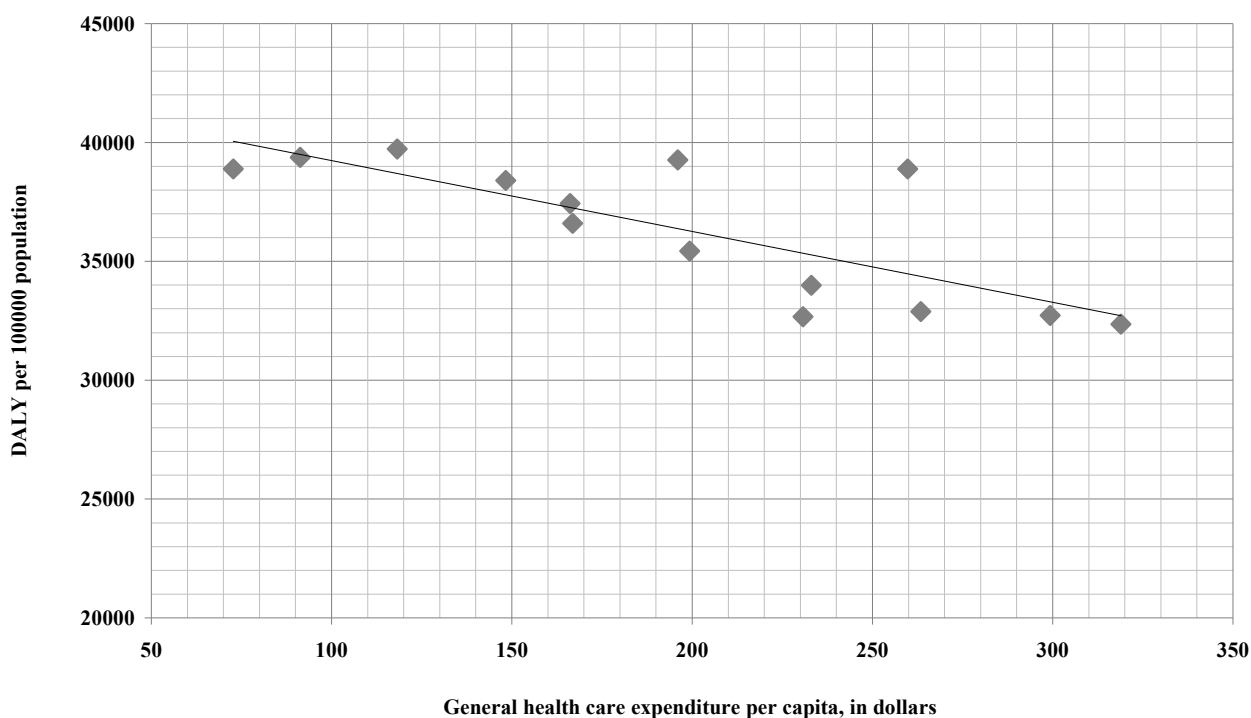


Fig. 3. Correlation between health care expenditures and losses of years of healthy living in Ukraine (2003-2017 years period)

According to WHO, the share of the overall burden of disease due to the 10 leading risk factors in the European region is 34%, and losses caused by these factors reach 8.8 years of potential life. The leading risk factors that affect the losses of years of healthy living in Ukraine and European countries do not differ, however, the severity of some of them in Ukraine is higher than in European countries [1]. For example, the standardized age-related prevalence of tobacco use among men aged 15 and over, by WHO estimates was 50.6% in 2013 in Ukraine, 38.5% and 31% in the European region and the European Union; protein intake per person per day – 89; 101 and 104 respectively; annual consumption of strong alcoholic beverages per person aged 16 and over in liters of pure alcohol – 4.2; 2.5 and 2.2 liters respectively.

Figure 4 presents data on the share of burden of diseases associated with specific risk factors and the diseases associated with the relevant risk factor. The share of DALY related to: 1) dietary risk is 28% (provokes the development of cardiovascular diseases – 25% of DALY, cancer – 1.5%; diabetes – 0.5%); 2) high blood pressure – 24% and is the main risk factor for cardiovascular diseases; 3) alcohol

abuse – 22% (contributes to cardiovascular disease – 10%, cirrhosis – 1.1%, cancer – 0.6% and trauma – 4.8% of DALY); 4) smoking is 13% (increases the risk of chronic respiratory diseases – 1.1%; cardiovascular diseases – 8.8% and cancer – 2.9%); 5) high body mass index – 11.8% (the main risk factor for cardiovascular diseases – 9%; diabetes – 1.3%; musculoskeletal diseases – 1.1%); 6) high total cholesterol – 7.9%, increases cardiovascular risk; 7) high blood glucose level gains 6% (increases the likelihood of cardiovascular disease – 4.3% and diabetes – 1.6%).

Considering the complex nature of the impact of risk factors on the global burden of disease and taking into account WHO recommendations for the management of the epidemic of chronic noncommunicable diseases (CNCD), a set of health care policy activities has been developed. This set does not claim to be an all-encompassing but it reflects the ideas of “integrated” prevention system on improvement of health of population in Ukraine (Table 3).

The development of a complex of public health measures aimed at reducing the global burden of disease was carried out on the basis of the WHO

2020 Health Policy, which recommends to increase the effectiveness of the interaction of the health sector with other related sectors (transport, education, agriculture, etc.) [10]. The need for a cross-sectoral approach to improve public health has been confirmed in numerous national and foreign studies [1, 2, 4, 6]. The measures combine population strategies that encourage the population to lead a healthy lifestyle and promote a healthy

social environment, and strategies for at-risk categories aimed at reducing the risk level through prevention measures at the individual level. WHO in its “Global Health Risk Factors” study highlights the particular importance of population strategies that have a significant impact on public health through legislation, taxes, financial incentives, campaigns on promotion of healthy lifestyles or improvement of engineering decisions [1].

Table 2

Ten leading causes of losses of years of life in Ukraine due to premature death and death adjusted for disability

Cause	DALY	
	per 100,000 of population, age-standardized	in %
Ischemic heart disease	6400,2	18.30
Strokes	2312,1	6.61
Cirrhoses of liver	1367,1	3.91
Self-injuries	1262,5	3.61
Cardiomyopathias	1229,3	3.51
Pedestrian accidents	1174,6	3.36
Neonatal disorders	1023	2.92
Disorders related to alcohol consumption	940,1	2.69
Infections of lower respiratory tract	915,8	2.62
Congenital defects	869,7	2.49
Other causes	17480,6	49.98
Total	34975	100

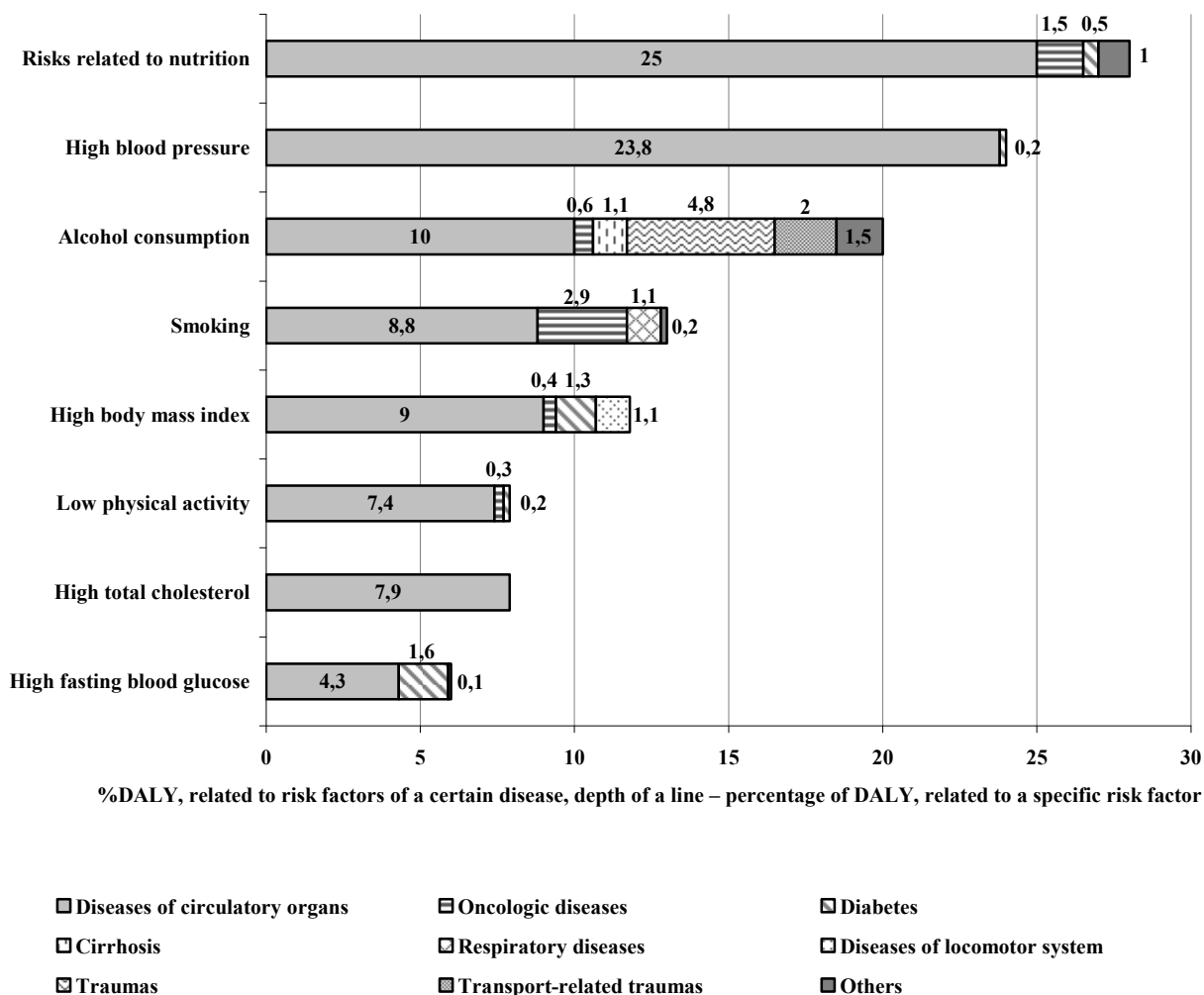


Fig. 4. Burden of diseases associated with leading risk factors in Ukraine (% of DALY; 2010)

It is important to note that meaningful measures to improve the health of the population need to be taken into account in four crucial circumstances:

1) Not all even the leading risk factors directly affect the development of the disease. In most cases, their activity is a kind of cause and effect chain, in which some factors act as immediate causes, others affect indirectly. For example, high blood pressure or high blood cholesterol act as immediate causes of coronary heart disease; lack of physical activity, alcohol consumption, smoking, excessive fat intake are factors that exert indirect influence; they are, in turn, influenced by such global factors as education and income [1].

Therefore, when designing policies to promote public health and disease prevention, it is necessary to model such links for different diseases that would further formulate population strategies that focus on changing social behavior by promoting healthy

lifestyle and reducing health risks, excluding strategies targeting people at high risk for certain diseases.

2) Most risk factors in one way or another are related to the development of multiple diseases, and thus a deliberate impact on these factors can reduce the number of causes causing a number of diseases. For example, reducing alcohol consumption will reduce mortality and reduce the incidence of circulatory diseases, cirrhosis, cancer and mental disorders.

3) Profitability of measures increases with their packaged implementation. For example, to reduce alcohol abuse – to excise tax, to create banning system, short tips at the primary health care stage, selective breath testing; to improve dietary regimen - enhancing stimuli to encourage producers and retailers to grow, use and sell fresh fruits and vegetables, introducing labeling that contains

accurate, standardized and comprehensive information on nutrient content in food, flexible pricing policy aimed at promotion of healthy eating, the introduction of strict control to prevent the impact on

children of all forms of marketing of high-energy food, saturated fats, trans fats, sugar or salt, etc. [1, 7].

4) Ensuring the implementation of the system of measures requires sound targeted funding.

Table 3

Tentative scheme of a set of measures of the health care system to improve the health of the population in Ukraine

Authorized bodies, separate sectors of public health	Taking into account the national context, targets for a specific timeframe to reduce the global burden of disease and its risk factors in Ukraine
Parliament	Adoption / correction and consolidation of legislative acts aimed at reducing the impact of major population risk factors (unhealthy diet, alcohol abuse, smoking, low physical activity); Amending tax legislation to financially stimulate risk mitigation; Approval of a nationally oriented strategy to tackle poverty and social inequality
National government	Approval of comprehensive cross-sectoral programs aimed at limiting the impact of leading risk factors on public health; Ensuring coherence of national public health policies and investment plans for the development of different industries; Ban on the promotion of tobacco and alcohol, beverages and other high-sugar products
Local governments/ communities	Approval of intersectoral sub-programs to reduce the impact of risk factors; Formation of infrastructure that promotes healthy behavior (swimming pools, courts, bike lanes, etc.); Introducing a system of financial incentives (incentive and negative) to reduce the impact of risk factors
Private campaigns	Clear implementation of state norms aimed at improving public health; Voluntary implementation of technologies that minimize the negative impact on health
Media, including the Internet and social networks	Motivation to post materials about healthy lifestyles; Creating barriers to advertising (direct and indirect) unhealthy or harmful behavior
Public health structures	Monitoring of public health; Creating registers of persons suffering from the most widespread AIDS; Monitoring of risk targets and behaviors; Outreach, communication and social mobilization for health
Primary health care delivery	Conducting evidence-based screening among risk groups to identify the diseases that account for the major share of the global burden of disease; Provision of rehabilitation, including treatment with the use of medicines under the reimbursement program; Creating health schools to effectively inform patients about risk factors and help change their behavior

CONCLUSIONS

1. In order to develop an effective health policy in Ukraine, it is necessary to rely on scientifically justified complex data on the impact of diseases and various risks on the health of the population. The current approach to this assessment is a comprehensive analysis of the global burden of disease, which is measured by the indicator of lost years of healthy living due to premature death and disability.

2. In the context of the transformation of the public health system in Ukraine, initiated in Ukraine, the use of the DALY indicator instead of simply

measuring the number of deaths and diseases, as well as quantifying factors that lead to the loss of a healthy life will provide a more accurate picture of causes, and through sound assessment to provide fundamental evidence to substantiate an adequate public health policy.

3. The development of a public health system based on such information basis should cover cross-sectoral activities and integrate population and high-risk strategies.

Conflict of interests. The author declares that there is no conflict of interest.



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